Universidad de Alcalá

TEACHING GUIDE

Network Engineering and Services

Degree in
Telematics Engineering (GIT)

Universidad de Alcalá

Academic Year 2025/2026

4th Year - 1st Semester (GIT)

Approved by the EPS School Board on June 16th, 2025

TEACHING GUIDE

Course Name:	**Network Engineering and Services**
Code:	**380018 (GIT)**
Degree in:	**Telematics Engineering (GIT)**
Department and area:	**Automática** **Automatic**
Type:	**Optional (Oriented) (GIT)**
ECTS Credits:	**6.0**
Year and semester:	**4th Year - 1st Semester (GIT)**
Teachers:	To be defined
Tutoring schedule:	This information will be provided in the first class.
Language:	Spanish/ English Friendly

1. COURSE SUMMARY

Networks and Services Engineering is an optional 6 ECTS course included in the firstsemester–fourthyear of the Engineering Degree on Telematics. The content is structured around the study of HybridFibre-CoaxialNetworks (HFC) as a paradigmatic example ofTV content access, telephony and data networks. The goal is to study the technologies involved in the dimensioning, planning, deployment and management of access networks, as well as their economic, legislative, feasibility and profitability implications. Fundamental standards related to multimedia contents are studied.The content of this course includes: HFCNetwork Architecture, business cases in CableNetworks, technologies, protocols and standards for data integration, telephony and TVinHFC networks, Digital TV, DVB-C / C2, DOCSIS.

2. SKILLS

Basic, Generic and Cross Curricular Skills.

This course contributes to acquire the following generic skills, which are defined in the Section 3 of the Annex to the Orden CIN/352/2009:

en_TR1 - Knowledge, understanding and ability to apply the necessary legislation during the development of the profession of Technical Engineer of Telecommunication and ease of handling specifications, regulations and mandatory rules.

en_TR7 - Know and apply basic elements of economics and human resources management, organization and planning of projects, as well as legislation,regulation and standardization in telecommunications

Professional Skills

This course contributes to acquire the following professional skills, which are defined in the Section 5 of the Annex to the Orden CIN/352/2009:

en_CTE1 - Ability to build, operate and manage telecommunications networks, services, processes and applications, understood as systems for capturing, transporting, representing, processing, storing, managing and presenting multimedia information, from the point of view of telematic services.

en_CTE6 - Ability to design network architectures and telematic services.

Learning Outcomes

Students successfully passing this course will be able to:

RA1: Identify the multimedia standards of representation, processing and storage of information, formats and compression techniques and associated transport protocols.

RA2: Design architectures of access networks and telematic services.

RA3: Integrate TV, data and telephony services in multimedia access networks.

RA4: Plan, dimension and analyze the viability and profitability of business cases of multimedia access network operators, identifying the legislation to be applied.

3. CONTENTS

Theory content blocks	Number of sessions, credits or hours
Introduction	2 hours (1 week)
CodingData, Audio and Images	4 hours (2 weeks)
Video coding	4 hours (2 weeks)
Digital video standards.Video broadcasting	2 hours (1 semana)
HFC Network Arquictecture	2 hours (1 semana)
Integration of TV, Data and Voice Digital Services	4 hours (2 weeks)
Business case of an HFC Network. Planning a NetworkOperator. Legislation	4 hours (2 weeks)
DVB-C, DVB-S andDOCSIS	6 hours (3 weeks)

Lab content blocks	Number of sessions, credits or hours
MATLAB fundamentals	4 hours (2 weeks)
Color coding and chroma sampling	6 hours (3 weeks)
Prediction of picture movement	6 hours (3 weeks)
Integration of the video coder	6 hours (3 weeks)
Planning a Cable Network Operator	6 hours (6 weeks)

4. TEACHING - LEARNING METHODOLOGIES. FORMATIVE ACTIVITIES.

4.1. Credits Distribution

Number of on-site hours:	58 hours (56 hours on-site +2 exams hours)
Number of hours of student work:	92
Total hours	150

4.2. Methodological strategies, teaching materials and resources

Theory sessions (large groups)	Concept presentations and/or reviews. Presentations and other activities.
Practical classes (small groups)	Practical concept presentation and/or review Problem solving. Case studies. Practical lab sessions to strengthen previously presented concepts.
Individual, group and online office hours	Solving student questions Support to autonomous learning
Autonomous student work	Reading assignments. Activities: exercises, information look up, self-assessment work.

Course structure

The course has a participatory approach, focused on the work of the student, the initiative, and the implementation of the concepts studied. The course is structured in two weekly sessions of 2 hour seach. The first session is of a large group, and it has a fundamentally theoretical character, dedicated to the presentation of concepts and the resolution of exercises. The second session is taught in a small group of students, is eminently practical, and is dedicated to the realization of lab exercises and a mini planning project for a cable operator.

5. ASSESSMENT: procedures, evaluation and grading criteria

Preferably, students will be offered a continuous assessment model that has characteristics of formative assessment in a way that serves as feedback in the teaching-learning process.

5.1. PROCEDURES

The evaluation must be inspired by the criteria of continuous evaluation (Learning Assesment Guidelines, LAG, art 3). However, in compliance with the regulations of the University of Alcalá, an alternative process of final evaluation is made available to the student in accordance with the Learning Assesment Guidelines as indicated in Article 10, students will have a period of fifteen days from the start of the course to request in writing to the Director of the Polytechnic School their intention to take the non-continuous evaluation model adducing the reasons that they deem convenient. The evaluation of the learning process of all students who do not apply for it or are denied it will be done, by default, according to the continuous assessment model. The student has two calls to pass the subject, one ordinary and one extraordinary.

Ordinary Call

In the ordinary call the student will be evaluated through the process of Continuous Evaluation. This process consists in the realization and improvement of laboratory practices, and the completion and passing of two exams, one in the middle of the semester and another exam at the end of the course.

In exceptional situations, duly justified, you can avail of an evaluation system through a **Single Final Exam**.

Extraordinary Call

The Extraordinary Call will have a similar exam format to the one used for the Final Exam assessment in the Ordinary Call.

5.2. EVALUATION

Assessment Criteria

The assessment criteria evaluates the degree of acquisition of the competences described in Section 2of this Syllabus. The following criteria are described:

CE1: The student has acquired the technical knowledge about the multimedia communication standards, related to the techniques of text, voice, image and video representation, as well as the formats and techniques of processing and compression applied, and the transport and storage protocols.

CE2: The student can complete an architectural design of a Hybrid Fiber Coaxial Access (HFC) network, with capacity and coverage criteria, based on a sheet of service supply requirements.

CE3: The student has acquired the fundamental technical knowledge related to the standards of voice, data and video integration in HFC access networks.

CE4: The student has acquired the legislative knowledge applicable to the deployment and exploitation of multimedia access networks.

CE5: The student demonstrates that she/he can make consulting reports on the planning, dimensioning, feasibility and profitability analysis of multimedia access network projects.

Grading Instruments

The following grading instruments will be applied to each of the assessment criteria:

1. **Laboratory Assessment Assignment (PL):** Consisting in the realization of laboratory practices with the Matlab computer tool.

2. **Homework Assignment(E):** Consisting in the design, planning and feasibility analysis of an HFC cable network operator.

3. **Intermediate Assessment Exams(PEI):** involving practical exercises and demonstration of knowledge about theoretical concepts.

4. **Final Assessment Exam (PEF):** involving practical exercises and demonstration of knowledge about theoretical concepts. It will be similar in structure to the PEIs, but covering the whole contents of the course, while each PEI covers different contents.

Grading Criteria

Ordinary Call, Continuous Assessment

Skill	Learning Outcomes	Evaluation criteria	Grading Tool	Contribution to the final mark
TR1,CTE1	RA1	CE1	PL	20%
TR1, TR7, CTE1,CTE6	RA1-RA3	CE1-CE3	PEI	35%
	RA1-RA4	CE1-CE5	PEF	35%
	RA4	CE4-CE5	E	10%

All exams and assignments are additive (there are no eliminatory tests). Students which, while undertaking the continuous assessment procedure, do not take any of the PEI and PEF, will have a “Not presented”grade in the ordinary call.

Ordinary Call, students without continuous assessment

Skill	Learning Outcomes	Evaluation criteria	Grading Tool	Contribution to the final mark
TR1, TR7, CTE1,CTE6	RA1-RA4	CE1-CE5	PEF	100%

Extraordinary Call, Continuous Assessment

Skill	Learning Outcomes	Evaluation criteria	Grading Tool	Contribution to the final mark
TR1,TR7,CTE1,CTE6	RA1	CE1	PL	20%
	RA1-RA4	CE1-CE5	PEF	70%
	RA4	CE4-CE5	E	10%

Extraordinary Call, students without continuous assessment

Skill	Learning Outcomes	Evaluation criteria	Assessment Instruments	Weight in final grade
TR1, TR7, CTE1,CTE6	RA1-RA4	CE1-CE5	PEF	100%

The teaching-learning methodology and the evaluation process will be adjusted when necessary, with the guidance of the Diversity Support Unit, to apply curricular adaptations for students with specific needs.

6. BIBLIOGRAPHY

6.1. Basic Bibliography

- Hans W. Barz, Gregory A. Basset, Multimedia Networks. Protocols, Design, and Applications, Wiley, 2016.
- Fred Hallsall, Multimedia Communications: applications, networks, protocols and standards, Pearson Education, 2001 books.google.es/books
- Normativas sobre TV Digital publicadas en DVB: http://www.dvb.org
- E. Pérez. Economía de la Empresa.Editorial Centro de Estudios Ramón Areces, Tercera Edición, 1994.

6.2. Additional Bibliography

- Roger L. Freeman, Fundamentals of Telecommunications, 2005, Wiley-IEEE Press, ISBN 978-0471710455
- **Standards**

- http://www.dvb.org
- http://www.cablelabs.org (DOCSIS)

Disclosure Note

During the evaluation tests, the guidelines set out in the Regulations establishing the Rules of Coexistence of the University of Alcalá must be followed, as well as the possible implications of the irregularities committed during said tests, including the consequences for committing academic fraud according to the Regulation of Disciplinary Regime of the Students of the University of Alcalá.